

REMARKS

This amendment responds to the Official Action mailed June 6, 2003 (Paper No. 4). The indication of allowability of the subject matter of claims 5-7, 26-34, 45, 15-25, and 37-44 is noted with appreciation.

The inventors have completed a review of the specification and claims. The specification is amended to provide a new (shorter) abstract, to correct obvious typographical errors noted during review, and to add serial numbers for related cases. No new matter is entered by any of these changes. Claims 5-7 are cancelled without prejudice or disclaimer. Claims 2, 9, 12, 14, 27, 28, 30, 35, and 37 are amended to increase their clarity and correct noted informalities. These claim amendments are made only for clarity and not for purposes relating to patentability. New claims 46-65 are added for examination on the merits.

Response to Rejections

Claims 1, 4, 9, 12-14, and 35-36 were rejected as obvious based on U.S. Patent 4,340,939 to Mayer. This rejection is respectfully traversed, and reconsideration is requested based on the further information that follows.

Claims 1 and 4

Independent claim 1 recites an angle rotator that uses both memory and computation to efficiently rotate an input point in the x-y plane through an input angle θ . In particular, claim 1 recites “a memory that stores a $\sin \theta_M$ value and a $\cos \theta_M$ value, wherein θ_M is a coarse approximation to said input angle θ .” Claim 1 further recites that a first digital circuit “performs a coarse rotation on said input complex

number based on said $\sin \theta_M$ value and said $\cos \theta_M$ value, resulting in an intermediate complex number.”

The Mayer '939 patent discloses an angle rotating device with coarse and fine circuit stages. However, the Mayer disclosure has no memory, such as a ROM lookup, as part of its first stage. A ROM is used in Mayer's second stage but it does not store \sin and \cos values or otherwise comply with the language of claim 1. Although the Official Action asserted that element 48 of Mayer's Fig. 5 is a memory, on further inspection it can be seen that element 48 is actually a decoder. Memory is defined as “a functional unit to which data can be stored and from which data can be retrieved.” The Mayer '939 patent does not disclose the claimed memory in Figure 5, and does not disclose a circuit that stores or retrieves *data* in the manner recited in claim 1.

The memory recited in claim 1 provides significant unobvious advantages in the context of the invention. In a digital-circuit environment, it is the combination of both memory and computation that yields the major advantages exhibited by the invention. Without using memory, for example, it would still be possible to create an angle-rotation device. In such a case, however, (unless all rotation angles are trivial) the amount of computational circuitry would increase very significantly—yielding a device that is far less desirable.

Since Mayer does not disclose or suggest the invention recited in claim 1, reconsideration of the rejection is appropriate.

Since claim 4 depends from claim 1, claim 4 is patentable for the same reasons noted with respect to claim 1. Further, claim 4 is independently patentable. Among other features not shown in Mayer, Claim 4 recites features performed by a second

digital circuit. The Official Action asserted that Mayer '939 discloses such a digital circuit in Figure 6. However, on further examination, it will be seen that Mayer Figure 6 does not disclose a digital circuit. Its multiply functions are performed by *mixed-signal* digital-to-analog converters. Its adders are implemented in analog form, with resistors and op-amps, as are the averager circuits. Further, those skilled in the art would not be motivated to create a digital circuit based on the Mayer disclosure. Mayer's feedback structure, essential for Mayer's circuit operation, is achieved via resistive analog components. This type of circuit could not be imitated in digital form. Trying to do so would require a digital circuit with delay-free loops, and such a circuit cannot physically be created.

Claims 9 and 12-14

As in the case of claim 1, claim 9 recites a memory. Claim 9 recites that the memory stores "one or more values that are indexed by a most significant word (MSW) of said input angle." As noted above, the Mayer patent does not disclose or suggest a memory, and particularly does not disclose or suggest a memory for the recited purpose. The MSW part of Mayer's input angle comprises only the two-bit word $E(A_1)$. This word is fed directly to the adder of Mayer's Fig. 2 and is not used to index a memory. Thus, Mayer does not disclose the structure recited in claim 9. There is also no motivation in Mayer for modifications that would be required to obtain the structure recited in claim 9.

With respect to claims 12-14, applicants respectfully traverse the assertions in the Official Action that Mayer's disclosure suggests the features of these claims. Further, these claims are patentable in view of their dependence on claim 9.

Claims 35-36

Claim 35 recites the step of determining a first value that is an approximation of $\sin \theta_M$, and determining a second value that is an approximation of $\cos \theta_M$. The Official Action suggests that Mayer's element 48 performs this function. However, Mayer's element 48 is merely a decoder. It does not determine a value that represents an approximation of $\sin \theta_M$ or $\cos \theta_M$. While the input of element 48 relates to an angle, its output will simply be a binary ON/OFF value on each of the four output wires 54, 56, 58, 60. Thus, no determination of first and second values that represent $\sin \theta_M$ or $\cos \theta_M$, either exactly or approximately, is provided by decoder 48. Nor does any other element of Fig. 5 provide this function.

With regard to claim 36, as noted previously, element 48 of Mayer's device is not a memory, so Mayer does *not* disclose or suggest retrieving the first value and second value from a memory as recited in claim 36.

Claims 3-8 and 10-11

Claims 3-8 and 10-11 were rejected as obvious based on the combination of Mayer '939 and U.S. Patent 5,276,633 to Fox et al. This rejection is respectfully traversed, and reconsideration is requested based on the following remarks.

The Fox reference does not remedy the deficiencies of Mayer with respect to teaching the features discussed above and recited in independent claims 1 and 9. In particular, Fox does not teach or suggest the memory recited in claims 1 and 9, and fails to teach the other particular operating features recited in these claims which distinguish them from Mayer. Mayer and Fox in combination do not show the

features of these claims, and there is also no motivation in Mayer or Fox for modifications that would produce the claimed invention.

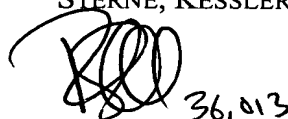
Claims 3-8 and 10-11 are believed to be independently patentable, and the assertions in the Official Action with respect to the teachings of Fox are respectfully traversed. However, since each of these claims depends from either claim 1 or claim 9, these claims are in any case patentable in view of the patentability of the independent claims.

Conclusion

Again, the indication of allowability of certain claims is noted with appreciation. It is believed that the rejected claims will be found allowable, after reconsideration based on the additional information provided above. If a personal or telephone conference would assist the Examiner in expediting prosecution, the Examiner is invited to call the undersigned, who will cooperate to advance the case.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

A handwritten signature in black ink, appearing to be "Evan R. Smith", with the number "36,013" written next to it.

Evan R. Smith
Attorney for Applicants
Registration No. 35,683

Date: 12/8/03
1100 New York Avenue, N.W.
Washington, D.C. 20005-3934
(202) 371-2600